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ABSTRACT

The role of autonomic arousal in feeling states has long been of interest to psychologists. To examine the necessity of arousal for an effective mood induction, 60 college students were instructed either to exercise vigorously (high arousal group), exercise lightly with a rest period (low arousal group), or complete a questionnaire (no arousal group). Half of each group read either a sad or a neutral story, and either concentrated on the passage or simply waited. Although it was predicted that highly aroused subjects (via exercise) who had to concentrate on a sad story would report a significant increase and persistence in sad mood, results indicated that sadness seemed to be inhibited by exercise. Subjects in the high arousal group reported themselves to be less sad than subjects in the low arousal group, who, in turn, were less sad than the no arousal group. An alternate hypothesis suggests that a persistence of sadness over time is a function of increased intensity of arousal. A mood induction without arousal may be effective but not as persistent as one including arousal. Prolonging transient mood states would provide a more reliable opportunity to study the phenomenon of mood. (Author/JAC)

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# The Role of Arousal in the Induction of Mood

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## Abstract

Based on Zillman's (1978) excitation-transfer model, this study examines the necessity of arousal for an effective mood induction. In a repeated measures 3x2x2 (Arousal x Mood x Concentration) design, it was predicted that highly aroused subjects (via exercise) who had to concentrate on a sad (vs. neutral) excerpt would self-report a significant increase and persistence in sad mood as compared to low and no arousal subjects. Results indicate that the opposite of the increase hypothesis was obtained. It is postulated that exercise served to inhibit a negative feeling state in the High Arousal group. An alternative hypothesis, however, suggests a persistence of sadness over time as a function of increased intensity of arousal. A mood induction without arousal may be effective but not as persistent as one including arousal. Prolonging transient mood states would provide a more reliable opportunity to study the phenomenon of mood.

## The Role of Arousal in the Induction of Mood

The role of autonomic arousal in feeling states has long been of interest to psychologists (e.g. James, 1884; Cannon, 1929; Schachter & Singer, 1962; Zillman, 1978; Clark, 1982). However, some researchers who rely on a consistent induction of mood as a means of examining various phenomena, such as judgment and memory processes, have either excluded discussion of autonomic arousal (Leight & Ellis, 1981; Teasdale & Fogarty, 1979; Isen et al., 1978) or have paid cursory attention to it (Bower, 1981; Clark & Isen, 1982). The purpose of this study was to examine the necessity of arousal for an effective mood induction. A brief examination of two divergent areas in the literature potentially relevant to the role of arousal in mood causation is, first, in order.

According to Clark & Isen (1982), mood is, in essence, a cognitive phenomenon which results from pleasant and unpleasant events "priming", or making more accessible, other similarly toned memories. These researchers rely on mood inducers which produce robust effects but which an individual would not tend to identify as the causal antecedent of a mood state; examples of this are receiving a small gift or finding a dime left in a public telephone. In their framework, arousal may not be a necessary component of mood. A possible interpretation of these "non-salient" antecedents suggests that the resultant affective state would be quite weak, easily altered, and of brief duration.

An alternate approach extends Zillman's (1978) excitation-transfer theory of emotion and the classic Schachter & Singer (1962) conception of emotional labeling and arousal. Emotional states are said to be a function of physiological arousal and available cognitions appropriate for labeling this arousal. The arousal is nonspecific; it creates an evaluative need because it has no plausible target in the environment. Extending this logic, we would argue that moods may be the residues of emotional states and, according to an arousal-transfer model, some arousal may remain long after an emotion-eliciting event has terminated. To the extent that the emotion and its residue trigger the kind of cognitive "looping" or priming postulated by Clark & Isen, a mood may be a function of a) the emotion-eliciting event, b) a decay period for that event, and c) subsequent proximal events, all in conjunction with a state of heightened physiological arousal slowly returning to a baseline.

Moods, then, may be viewed as a feeling state arising from some combination of cognitions and arousal. If so, one may suggest a category of mood inductions in which the antecedent event(s) <u>may be</u> salient but the elicited state may be best described as a blend; that is, the antecedent cognitions and arousal are potentially identifiable although an individual is likely to be unaware of one or both of them. Some "mood" emerges from one's inability to label oneself as being in a specific emotional state. Examples of this are films and slides (e.g.

Zillman, 1971; Schiffenbauer, 1974; Cantor, Bryant & Zillman, 1974), thinking "happy" or "sad" thoughts (e.g. Moore, Underwood & Rosenhan, 1973; Brewer, Doughtie & Lubin, 1980), and reading a series of self-referent affectively-toned statements (e.g. Velten, 1968; Carson & Adams, 1980; Strickland, Hale & Anderson, 1973.) The mood induction techniques in the studies just cited seem to make it differentially probable that a subject will be able to identify the causal stimuli involved. The Zillman (1978) model, in particular, suggests that direct manipulations of arousal should aid in the induction of mood when used in conjunction with plausible mood-inducing stimuli.

Using a form of a "salient antecedents" induction within an arousal-transfer model of mood, this study proposes to manipulate level of arousal, mood, and amount of concentration on the affective stimuli in order to delineate the role of arousal in mood induction. Using repeated measures of self-reported affect, it was predicted that subjects in a high arousal condition who were instructed to concentrate on an affectively laden excerpt would indicate a significant increase and persistence in mood as compared to both low and no arousal conditions.

## Method

Sixty Dartmouth undergraduates, both male and female, served as subjects in a 3x2x2 (arousal level x concentration x mood passage) design. The purpose of the study was described as an

examination of the combined effects of the mood of a written passage and arousal. All subjects were asked to come prepared to exercise and, upon arrival, were informed that other groups would be exposed to different levels of arousal, have different passages to read, and have different tasks to perform. Although the predictions were not made explicit, no overt deception was involved. These individuals were instructed to either exercise vigorously (high arousal group), exercise lightly with an equivalent rest period (low arousal group), or complete a questionnaire (no arousal group) for a set period lasting 20 minutes for each group (after Schachter & Singer, 1962; Zillman, 1978). Immediately after this, half of each group read either a (prejudged) sad or a neutral passage, each taking an average of 7 minutes to complete. The sad passage consisted of a description of the events immediately prior to the death of a terminally ill young man. The neutral passage was a fictional story illustrating the philosophical difference between mind and body.

Then, half of these subjects were instructed to either concentrate on their passage or to just sit with no instructions (other than to keep to themselves) for another set period of 10 minutes (after Velten, 1968). All subjects were run in mixed-sex groups of 3 to 14 members. Each of the 12 conditions was equated for time.

The dependent measure consisted of a series of Mood Adjective Check Lists or MACLs (Nowlis, 1970). These occurred a)

at the outset or T1, b) immediately after reading the mood passage or at T2, c) immediately after the 10 minute concentration or sitting period or at T3, and d) after the debriefing or at T4. In order to examine changes in mood induced by arousal and mood passage, T1 and T2 were compared. In order to examine the persistence of mood effects as induced by arousal, mood passage, and concentration period, T2 and T3 were compared. Finally, as an ethical consideration, measurement at T4 was employed to assess whether the mood effect had dissipated. Each MACL consisted of 11 factors with 3 randomly selected items composing each factor, appropriately counterbalanced for order. The main dependent measure was the sadness factor; the other factors were included to reduce demand and for exploratory purposes.

## Results

A preliminary analysis established that the groups did not differ in Sadness prior to the experimental inductions. A major hypothesis of the study was that subjects would show the most Sadness when reading the sad passage after a highly arousing experience. This hypothesis was evaluated using a repeated-measures analysis of variance; the predicted triple interaction of Time (T1 vs. T2) x Mood Passage (Sad vs. Neutral) x Arousal (High vs. Low vs. No) was not significant ($F(2,48)=0.27$, $p<.77$). However, all 3 main effects were significant (Time:

$F(1,48)=17.33$, $p<.0002$; Mood Passage: $F(1,48)=10.08$, $p<.003$; Arousal: $F(2,48)=3.07$, $p<.05$), as were the two-way interactions of Time x Mood Passage ($F(1,48)=10.36$, $p<.002$) and Time x Arousal ($F(2,48)=5.49$, $p<.007$). Although the Time x Mood Passage interaction produced means in the appropriate direction (see Fig. 1, Table 1), the means for the Time x Arousal interaction fell in an unexpected direction (see Table 2). As indicated by Scheffe' tests, the Sadness measure appears to have been inhibited by exercise; subjects in the High Arousal group reported themselves to be less sad than subjects in the Low Arousal group ($F(1,48)=3.33$, $p<.07$) who, in turn, were less sad than the No Arousal subjects ($F(1,48)=4.79$, $p<.03$) at time T2 (see Figure 2).

In order to determine the extent to which mood changed over the 10 minute concentration or waiting period, a repeated-measures ANOVA was performed comparing T2 and T3. The predicted triple interaction of Time (T2 vs. T3) x Mood Passage x Arousal was, again, nonsignificant ($F(2,48)=1.14$, $p<.33$). Significant main effects for Mood Passage ($F(1,48)=23.34$, $p<.0000$) and Arousal ($F(2,48)=4.15$, $p<.02$), however, were obtained showing an overall Mood Passage effect in the appropriate direction [Means: sad passage = 4.48; neutral passage = 2.02] and means for the arousal conditions again in an unexpected direction. No significant effects of Concentration were obtained; data were subsequently collapsed across this factor.

The Time x Arousal interaction achieved significance

($F(2,48)=3.67$, $p<.03$). (See Table 3 and Figure 2.) An examination of the means used in post hoc comparisons (Scheffe') suggests that Sadness level in the High Arousal group increased but not significantly ($F(1,48)=1.71$, $p<.19$), persisted in the Low Arousal group ($F(1,48)=0.16$, $p<.69$), and significantly decreased in the No Arousal group ($F(1,48)=6.32$, $p<.01$). This interaction may be most parsimoniously interpreted as a simple return to "baseline" by the No Arousal subjects who showed the largest increase in sadness from T1 to T2.

It may also be that there was a relative persistence in self-reported sadness as a function of increased intensity of autonomic arousal. A complete return to baseline would suggest no differences in Sadness in comparing times T1 and T3. This is not the case. Two significant main effects [Time: $F(1,48)=11.6$, $p<.0015$ and Mood Passage: $F(1,48)=8.27$, $p<.006$] and a significant Time x Mood Passage interaction ($F(1,48)=9.42$, $p<.0036$) were obtained (see Table 4). Clearly, the predicted Time x Mood Passage x Arousal interaction needs to be obtained to more confidently make this interpretation.

In a final analysis, no significant differences were obtained for any effect at time T4 alone. A T3 vs. T4 comparison was performed, yielding a notable significant Time x Mood Passage interaction ($F(1,48)=13.98$, $p<.0006$) in the expected direction. The means indicate a consistent decrease in sadness. By the end of the debriefing, all effects of sad mood and arousal seem to

have dissipated.

## Discussion

The original prediction, that subjects who read the sad passage after exercising vigorously would self-report the most sadness, requires revision; it still, however, served as a useful guide with which to explore the data. The direct opposite of the increase proposition was obtained. In accord with Clark & Isen (1982), it may be that affective labeling of arousal (that produced by both the exercise and the stimulus passages) was unnecessary for the High Arousal group; an adequate explanation from a salient antecedent event - vigorous exercise - was available. An evaluative need was created in the No Arousal group when pressed for an assessment of their feelings. These individuals subsequently attributed their feeling to the only available plausible cause, the cognitions associated with the mood passages. The intermediate position of the low arousal group lends credence to this suggestion.

The results may simply, of course, be ascribed to interference from exercise-induced arousal. Excess arousal may have prohibited the relevant subjects from paying adequate attention to the mood stimuli. Recent articles by Griest, Klein, Eishens, Faris, Gurman & Morgan (1978) and Stogel & Levy (1982) suggest that exercise may make subjects become so aware of their bodily sensations that they are distracted from symptoms of

depression. Griest et al. (1978) go so far as to define distraction as a concentration on bodily sensations. The absence of any effect of the sad mood passage on the High Arousal subjects may be accounted for by this. These authors also suggest that the physical consequences of 15 to 30 minutes of exercise may not only inhibit but serve to alleviate depressive cognitions in fit individuals. This implies that the self-regulatory effect of exercise-induced arousal on sad mood may be employed for therapeutic purposes.

Although speculative, the persistence results may also prove informative. In accord with Zillman, the level of affect present in the arousal groups at time T2 persisted through time T3 as a function of decay of arousal. Decay was possible for these groups; examination of the T3 vs. T4 comparison shows that self-reported sadness did significantly decrease by T4. The No Arousal group did not maintain their affect, possibly because a necessary "carry over" effect from heightened arousal was absent. This suggests that a mood induction involving autonomic arousal will provide a longer and therefore more reliable opportunity to administer a dependent measure of interest than will one without arousal. Indeed, the future of studying the phenomenon of feeling states as subtle as moods may rely on this consistency.

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Table 1

Means for Time x Mood Passage, T1 vs. T2

| | | Mood Passage | |
|---|---|---|---|
| | | Sad | Neutral |
| Time | T1 | 1.76 | 1.76 |
| | T2 | 4.63 | 2.13 |

Higher numbers reflect greater self-reported sadness.

Table 2

Means for Time x Arousal, T1 vs. T2

| | | Arousal | | |
|---|---|---|---|---|
| | | No | Low | High |
| Time | T1 | 1.65 | 1.6 | 2.05 |
| | T2 | 4.8 | 3.3 | 2.05 |

Higher numbers reflect greater self-reported sadness.

Table 3

Means for Time x Arousal, T2 vs. T3

| | | Arousal | | |
|---|---|---|---|---|
| | | No | Low | High |
| Time | T2 | 4.8 | 3.3 | 2.05 |
| | T3 | 3.55 | 3.1 | 2.7 |

Higher numbers reflect greater self-reported sadness.

Table 4

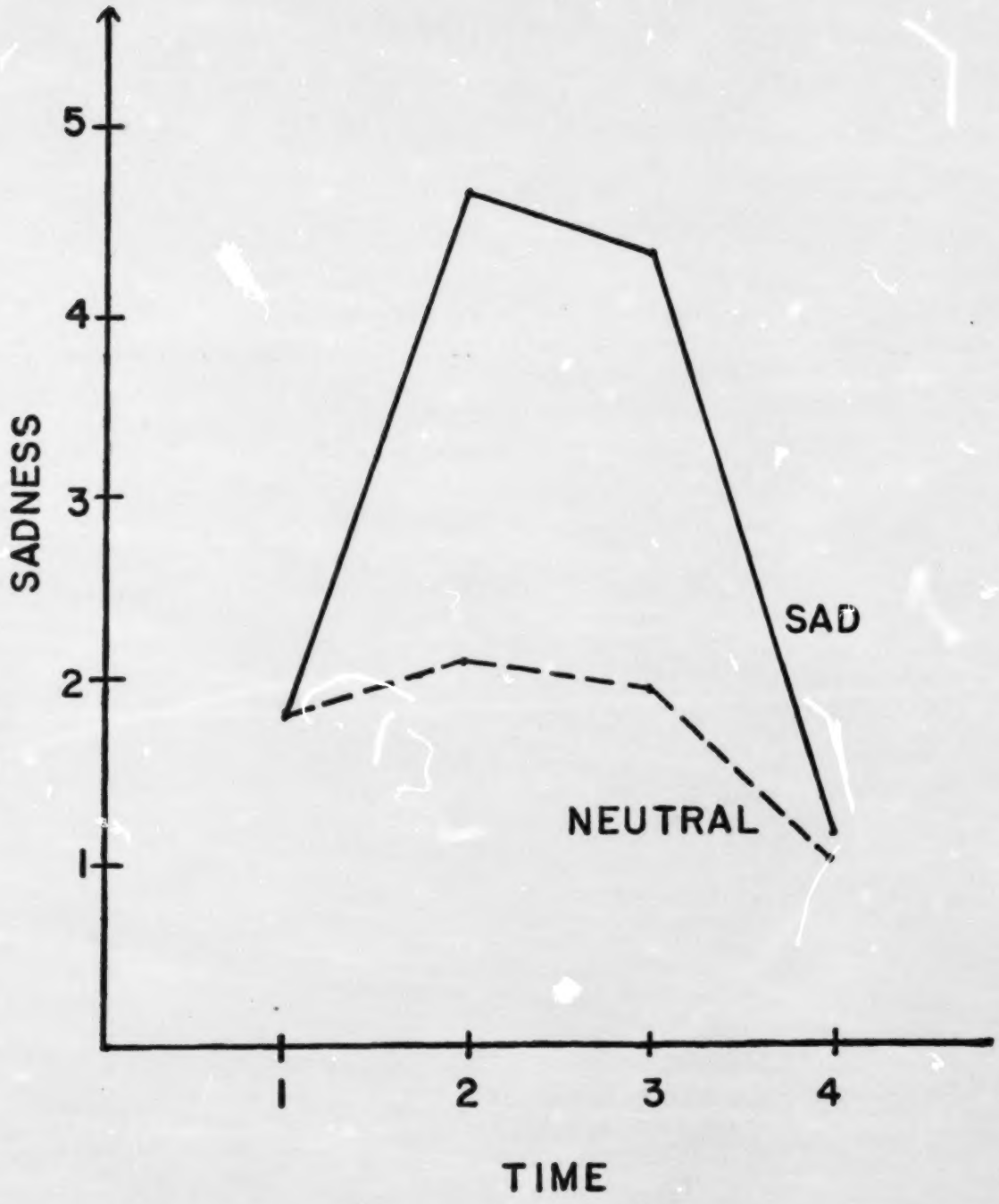
Means for Time x Mood Passage, T1 vs. T3

| | | Mood Passage | |
|---|---|---|---|
| | | Sad | Neutral |
| Time | T1 | 1.76 | 1.76 |
| | T3 | 4.33 | 1.9 |

Higher numbers reflect greater self-reported sadness.

TIME X MOOD PASSAGE

Figure 1



TIME X AROUSAL

Figure 2